

REMARKS

Claims 1-69 are all the claims pending in the application; the Examiner failed specifically to address claim 65. Claims 1, 31, 37, and 50 have been amended, and claims 66-69 have been added, to recite aspects of the disclosed embodiments more clearly. No new matter has been added.

Claim 23 stands rejected under 35 U.S.C. §102(b) as anticipated by United States Patent (USP) 4,973,159 to Sohma et al. (Sohma). Claim 31 stands rejected under 35 U.S.C. §102(b) as anticipated by USP 3,886,363 to Ohnishi et al. (Ohnishi). Claims 1-22, 24-30, and 32-36 stand rejected under 35 U.S.C. §103(a) as unpatentable over Ohnishi in view of Sohma. Claims 37-64 stand rejected under 35 U.S.C. §103(a) as unpatentable over Ohnishi in view of Sohma, and further in view of USP 5,662,400 to Shikama et al. (Shikama). Applicants respectfully traverse the foregoing prior art rejections, and request reconsideration and allowance of all the pending claims based upon the following comments.

Applicants note that the present application is generally directed to “wavelength scanning fluorescence spectrophotometers using dual grating monochromators, but not optical filters, to select excitation and emission wavelengths of light and to detect and to quantify simultaneous fluorescence emission, including polarized fluorescence emission, from multiple fluorophores” (page 1, lines 8-11). The pending claims are directed particularly to a fluorescence spectrophotometer system and sample analysis methods, as well as to embodiments of a double monochromator and a reflection light transfer module; these latter embodiments may be incorporated in the spectrophotometer system and the recited method of analyzing a sample.

Specifically, the present application discloses a scanning, photon-counting fluorescence spectrophotometer for multiplex (*i.e.* multi-wavelength) calibrated detection of fluorescence emission which generally employs a dual grating, non-collimating monochromator for excitation and another dual grating, non-collimating monochromator for emission; an embodiment of such monochromators is illustrated, for example, in FIG. 2A and described in the discussion beginning at page 13, line 35, and continuing through page 15, line 8. In operation, both monochromators enable

selection and transmission of monochromatic light ranging from ultraviolet to infrared wavelengths. Additionally, a coaxial light transfer module as recited in the pending claims is illustrated, for example, in FIG. 3 and described in the discussion at page 15, line 32, through page 17, line 2. In operation, the light transfer module enables both excitation and emission of a sample via a single shared light path. That is, both excitation and emission light paths lie on the same axis (*i.e.*, “co-axial”) and are not optically separated, but are oriented at 180° to each other.

35 U.S.C. §102(b) Rejections

Turning now to the asserted references, claim 23 stands rejected as anticipated by Sohma, and claim 31 stands rejected as anticipated by Ohnishi, as noted above. To anticipate a pending claim under 35 U.S.C. §102(b), a reference must specifically teach every element recited in the pending claim, or at least inherently include every such element (*see*, MPEP §§2131 and 2131.01). In that regard, Applicants submit that the Sohma patent and the Ohnishi patent are more deficient than the Examiner acknowledges.

Ohnishi

The elements of the Ohnishi reference identified by the Examiner (*i.e.*, an excitation mirror 18 and an emission mirror 20) and asserted as equivalent to the “light transfer module” recited in claim 31 of the present application are neither equivalent, nor even similar, to the structural components of the claimed light transfer module. Further, the combination of components cited by the Examiner cannot and does not perform the function of the claimed light transfer module.

Specifically, the Ohnishi reference fails to disclose coaxial excitation and emission mirrors, and therefore neither teaches nor suggests a light transfer module as illustrated and described in the present application and as recited in the pending claims. Pending claim 31, for example, recites a light transfer module as set forth in the present specification at page 16, lines 3-25. As noted at this portion of the specification, “coaxial placement of excitation mirror 302 with an area to be illuminated, as well as the coaxial placement of emission mirror 304 with an area emitting light, combine to ensure that a high percentage of excitation light is directed onto the sample . . . and that

a high percentage of the fluorescence . . . light emitted . . . is collected for analysis.” It is readily apparent from examination of Figures 1, 3, and 4 of the present application that the coaxial alignment of the excitation and emission mirrors of the claimed light transfer module enables excitation light and emission light to travel along shared light paths, and that the path of fluorescence detection is oriented at 180° to the path of excitation light. Consistent with the foregoing description, claim 31 specifically recites “an excitation mirror positioned substantially coaxial with an area to be illuminated” and “an emission mirror positioned substantially coaxial with the illuminated area.”

In contrast, the Ohnishi reference neither discloses nor suggests a component corresponding to, or equivalent to, the recited light transfer module. Indeed, it is clear that Ohnishi’s mirrors must be optically isolated from each other; in other words, the 90°, or orthogonal, excitation and emission light paths taught in the Ohnishi patent are not coaxial. Examination of FIGS. 2-6 in Ohnishi clearly illustrates the severe angular orientation of the excitation mirror 18 and the emission mirror 20.

Applicants submit that the Ohnishi patent neither teaches nor suggests, among other things, the light transfer module as described in the present application and as specifically recited in pending claim 31. Accordingly, the rejection of claim 31 under 35 U.S.C. §102(b) is improper; this claim is allowable at least for the reasons set forth above.

Sohma

With respect to the Sohma reference, Applicants initially note that the “second spectroscope 4 of FIG. 1 is disposed so as to perform a light mixing function” (*see, e.g.* Sohma, column 13, lines 35-49). In that regard, the Examiner has failed to appreciate that the Sohma reference particularly teaches a dual grating image forming monochromator that does not pass selected wavelengths of monochromatic light, but rather mixes light reflected off the first grating to form an image of the full spectrum, *i.e.*, the Sohma apparatus functions as an image forming spectroscope. Specifically, the intermediate and outlet slits (reference numerals 3 and 19, respectively) and the second grating (11b) taught in Sohma combine to mix light from the first grating (11a) to form an image of the full spectrum of the incident light that enters through the inlet slit (15). In contrast, both optical gratings as described in the present application and as recited

in claim 23 are operative to intercept and “to disperse” light passed through the entrance slit and the first selection slit, respectively.

Sohma neither teaches nor suggests “a second optical grating positioned to disperse at least part of the light passed through the first selection aperture” as recited with particularity in claim 23. In that regard, Applicants direct the Examiner’s attention to FIG. 2 of Sohma, where the light incident on the second optical component 11b is combined or mixed as it is transmitted to the mirror 16.

As a consequence of its construction and the interrelationship between the components, the Sohma apparatus cannot isolate and transmit light of a single wavelength, and therefore cannot function as a monochromator as contemplated and claimed in the present application. Accordingly, Sohma neither teaches nor suggests the subject matter recited in pending claim 23, and the rejection of this claim is improper. Applicants submit that claim 23 is allowable at least for the reasons set forth above.

35 U.S.C. §103(a) Rejections

As set forth above, claims 1-22, 24-30, and 32-36 stand rejected as unpatentable over Ohnishi in view of Sohma, and claims 37-64 stand rejected as unpatentable over Ohnishi in view of both Sohma and Shikama. Given the foregoing deficiencies of the individual primary and secondary references asserted by the Examiner, Applicants respectfully submit that the claim rejections based upon 35 U.S.C. §103(a) are improper, and that an ordinarily skilled artisan would not have been motivated to combine the references in the manner suggested by the Examiner.

For example, and as set forth above, the Sohma reference is directed particularly to a single, dual grating imaging monochromator. Specifically, the second grating in Sohma’s image forming monochromator “mix[es] that part of the spectral components which exists in a desired wavelength range” in a system and method of “forming a mixed light image” (*see, e.g.* column 22, lines 48-51). Hence, the Sohma disclosure teaches a single, dual grating, collimating imaging monochromator which produces an image of a complete emission spectrum for light generated by an external and independent polychromatic light source; the Sohma apparatus cannot be used as a

wavelength monochromator. Accordingly, the Sohma disclosure fails to teach or even to suggest the subject matter recited in any of claims 1-69.

The operational characteristics of the device taught in Sohma are directed to mixing light off the second mirror. The pending claims directed to or incorporating a monochromator, in contrast, specifically recite that both the first and the second optical gratings of the double-monochromator “separate” (claims 1 and 37) or “disperse” (claim 23) rather than mix, light passed through the entrance slit and the first selection slit, respectively. Pending claim 23, for example, particularly recites a second grating in a wavelength selecting emission monochromator “positioned to disperse at least part of the light passed through the first selection aperture;” the second selection slit is “positioned to intercept part of the light dispersed by the second optical grating.” Similarly, the second monochromator recited in claims 1 and 37 is operative “to separate the . . . light . . . into a plurality of wavelengths and to output selected wavelengths.” Applicants respectfully submit that the rejection of claims 1-22, 24-30, and 32-69 is improper at least to the extent that the Examiner relies upon the teachings of the Sohma reference; Sohma fails to teach a monochromator as described and claimed in the present application. In addition to the reasons set forth above with reference to claims 23 and 31, claims 1-22, 24-30, and 32-69 are allowable for the foregoing reasons as well.

Further, claims 31-36 and 50-55 are particularly directed to a “light transfer module” which generally comprises “an excitation mirror positioned substantially coaxial with an area to be illuminated” and an emission mirror (claim 31) or other reflective surface (claim 50) “positioned substantially coaxial with the area to be illuminated.” Independent claims 1 and 37 incorporating a light transfer module contain similar limitations. The optical components of the Ohnishi reference are not coaxial as described in the present application and as recited in independent claims 1, 31, 37, and 50; in particular, excitation and emission light in the Ohnishi apparatus do not follow a single light path, as is clear from an examination of FIGS. 2-6.

Accordingly, the rejection of claims 1-22, 24-30, and 32-69 is improper at least to the extent that the Examiner relies upon the teachings of the Ohnishi reference; the Ohnishi patent neither teaches nor suggests the light transfer module recited in the

pending claims. Applicants respectfully submit that claims 1-22, 24-30, and 32-69 are allowable at least for this additional reason.

Applicants note additionally that, since neither reference provides suggestion or motivation to combine their respective teachings, it would not have been obvious to combine the Ohnishi and Sohma references in the manner suggested by the Examiner. Finally, the combination of Ohnishi and Sohma, even if proper, still fails to teach or to suggest a light transfer module as described in the present application and as incorporated into the pending claims; similarly, the combination fails to teach or to suggest a monochromator as described and claimed in the present application. Accordingly, Ohnishi and Sohma, whether considered alone or in combination, neither anticipate nor render obvious any of the pending claims. In addition to the arguments set forth above with reference to claims 23 and 31, Applicants submit that claims 1-22, 24-30, 32-36, 66, and 67 are allowable for these additional reasons as well.

Claims 37-64 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Ohnishi and Sohma in view of Shikama. As noted above, the Ohnishi reference neither teaches nor suggests a light transfer module as shown, described, and recited in the claims of the present application; similarly, the Sohma reference fails to teach a wavelength monochromator as described and claimed in the present application. Claims 1-69 are allowable at least for reasons set forth above, irrespective of the fair teachings of Shikama, which fails to supply the foregoing deficiencies.

Accordingly, the combination of inadequate teachings from Ohnishi and Sohma with the equally inadequate teachings from the Shikama patent fails to teach or to suggest the subject matter of pending claims 37-64, 68, and 69. In addition to the reasons set forth above with reference to claims 23 and 31, Applicants submit that claims 37-64, 68, and 69 are allowable at least because the combination of the references, including the Shikama patent, neither teaches nor suggests a light transfer module and a monochromator as set forth with particularity in pending claims 37-64, 68, and 69. Even assuming, *arguendo*, that the Shikama patent teaches what the Examiner asserts it does, the combination of references still fails to teach or even to suggest every element recited in the pending claims.

CONCLUSION

Specifically, the prior art of record, whether the references are considered individually or in combination, fails to teach or to suggest, *inter alia*, a light transfer module and the double monochromators recited with particularity in the pending claims. Accordingly, Applicants respectfully submit that independent claims 1, 23, 31, 37, 50, and 56 are allowable at least for the reasons set forth above. Similarly, dependent claims 2-22, 24-30, 32-36, and 38-49, 51-55, and 57-69 are directed to specific aspects of the disclosed embodiments, and are additionally allowable for their respective recitations.

Based upon the foregoing arguments, Applicants respectfully submit that the subject application is in condition for immediate allowance. If the Examiner believes that a telephone conference might expedite prosecution of this application, please telephone the undersigned at (858) 509-4007.

Please apply any charges or credit any overpayments to Deposit Account No. 03-3975.

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